

## **Reexamining Carnegie research institutions: Evidence from IPEDS data**

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*Abstract: Officials at the Carnegie Foundation for the Advancement of Teaching changed the system that had been used to classify institutions of higher education in 2000. Part of the redesign was a change in the criteria for placement of doctoral degree granting institutions. Especially noteworthy was the removal of specific levels of research funding as a distinguishing feature of commitment to research. Do the new criteria accurately capture differences in priorities as measured by expenditures across all educational categories? Are there significant differences in overall patterns of spending that distinguish the types of graduate programs categorized by the new instrument? This research effort is an attempt to address these questions by examining expenditures in three major categories of university operations—research, instruction, and public service.*

*Keywords: research, instruction, public service, Carnegie Foundation*

### **I. Introduction.**

The Carnegie classification of institutions of higher education was developed in 1971 and initially published in 1973 under the leadership of Clark Kerr to provide a portrait of the diversity of higher education in America and to enable researchers to make meaningful comparisons about educational performance across a range of similar institutions. The classification was updated in 1976, 1987, and structurally revised in 1994. By the late 1990s, the Foundation members identified significant problems with the categories utilized. These included the tendency by institutions to view the classification as a hierarchy in which they would compete to “move up” the ladder, and the more systemic concern that the classification matrix imposed an external framework that failed to capture the institutions’ own focus or mission. In 1997, Lee Shulman, president of the Foundation, convened a group of scholars to re-conceptualize the scheme. Reconfiguration was to be completed in two stages. First, a reclassification was advanced in 2000 to include updated data and a consolidation of some categories. Second, re-conceptualization and additional data collection would continue until 2005 at which time the Foundation would provide a more “sophisticated, adaptive set of tools that allows users to cluster information in several different ways...[and to]...provide a series of lenses through which to examine and analyze institutional mission and other important differences among institutions” (Carnegie Foundation for the Advancement of Teaching, 2001, p.viii).

Under the original classification, five broad categories were employed: doctoral-granting institutions, comprehensive universities and colleges, liberal arts colleges, two-year colleges and institutes, and professional schools and specialized institutions. The scheme was modified in 1994 to include doctorate-granting institutions, master’s (comprehensive) colleges and universities, baccalaureate colleges, associate of arts colleges, specialized institutions, and tribal colleges and universities (Carnegie Foundation for the Advancement of Teaching, 2001, p.10). In 1973, doctoral institutions were divided into four categories: research universities I and II and doctoral-granting

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universities I and II. Research universities were ranked not only on the basis of degree conferral but also on the institution's relative ranking in attracting federal research funds. The top 100 institutions receiving federal money were simply split with the top 50 inserted into category I and the remainder in category II (Carnegie Foundation for the Advancement of Teaching, 2001, pp.10-12).

In 1987, research universities were distinguished not on the basis of relative rank in funding received but on the basis of an assigned threshold of research support. Category I institutions received at least \$33.5 million and category II institutions secured between \$12.5 and \$33.5 million annually. These thresholds were modestly raised in 1994 (Carnegie Foundation for the Advancement of Teaching, 2001, p.12). The 2000 classification scheme has undergone two substantial changes. First, the subcategories of doctoral-granting institutions was reduced from 4 to 2 and labeled doctoral/research universities—extensive and doctoral/research universities—intensive. Second, a new category of baccalaureate colleges was established (baccalaureate/associate's colleges), continuing in the mode of emphasizing degrees rather than broader functional categorization. Importantly, however, Foundation scholars changed the measures they utilized for inclusion in some categories. A comparison of Carnegie classifications for 1973, 1994, and 2000 is provided in Table 1.

The doctoral/research category is the primary focus of this paper, and the two categories in the 2000 classification are doctoral/research extensive and doctoral/research intensive. The Foundation evaluators deleted the criteria of federal funding for research because they found it to be variable and unreliable from year to year, and because the funding criteria tended to favor institutions specializing in scientific and technical research rather than the humanities and social sciences (Carnegie Foundation for the Advancement of Teaching, 2001, p.14). Instead, the new categorization relies primarily on number of doctoral degrees awarded and number of disciplines represented (i.e., 50 or more doctorates were awarded per year across at least 15 disciplines in the institutions in the doctoral extensive category; at least 10 doctorates per year across 3 or more disciplines, or at least 20 doctorates were awarded per year in the institutions represented in the doctoral intensive category).

The Foundation officials determined that since doctoral education emphasizes research, that the number of degrees serves as an appropriate proxy for research spending (Carnegie Foundation for the Advancement of Teaching, 2001, p.27). The Foundation analysts offer some evidence in this regard by comparing newly categorized institutions with National Science Foundation (NSF) survey data related to federal science and technology funding and to self-reports of federal and nonfederal research expenditures at a subset of institutions (Carnegie Foundation for the Advancement of Teaching, 2001, pp.28-29). As the Foundation leaders hypothesized, research expenditures among the doctoral extensive institutions far exceed that of their doctoral intensive counterparts.

Nevertheless, Foundation findings with regard to categorizing research institutions are not definitive. The classifications do not necessarily account for an institution's own priorities with regard to its educational mission. Better data does exist for analyzing an institution's commitment to research. Use of such data and the type of analysis provided below may move the Carnegie Foundation closer to its goal of incorporating the institution's own sense of mission (as indicated by commitment to expenditure categories) in future classifications.

## **II. Research Justification.**

This investigation affords instructors a foundation of knowledge that is essential in understanding a complex array of institutions in the United States. How can an informed discourse of teaching and learning perpetuate without at least some rudimentary understanding of the importance of resource allocations to instruction, research, and service, the three primary missions within the academy? An enlightened discussion about values and priorities concerning teaching, research, and service will

hopefully ensue. For example, should certain institutions spend more, or less, on these fundamental objectives? Are instruction and research mutually exclusive or complementary, i.e., does more research investment result in lower spending on instruction or enhance the teaching mission as the knowledge base of the instructor/researcher has been increased by some exponent?

Higher education instructors should endorse the very ideal that many promote to their own students in the classroom. By way of illustration, public budgeting students are taught that understanding resource allocation in the public sector is akin to good citizenship. This is why students regularly scrutinize federal, state, and local budgets. After all, how can citizens hold elected officials accountable without knowing how they reallocate resources in a complex world? Many in education, the social sciences, and humanities subscribe to the Holmesian notion (Holmes, Jr., 1897) that the essence to understanding the world is theory. Ideas have been much more central to social and political change than military power. Yet policies have a definitive impact on what we can aspire to accomplish as academicians. A greater understanding of the policy realities of today will help us all work toward a more utopian ideal of the future when it pertains to defining and refining the process of evaluating excellence in teaching and learning.

### **III. The Data.**

The National Center for Education Statistics (NCES) of the U.S. Department of Education receives annual data from all postsecondary institutions in the United States, covering a range of topics including student enrollments, institutional revenues, institutional expenditures, faculty salaries, completions of programs, and demographic characteristics. These surveys are encompassed by the Integrated Postsecondary Education Data System (IPEDS) (U.S. Department of Education, 2003). For this evaluation, the finance survey is utilized to obtain a measure of policy commitment to instruction, research, and public service. The finance survey includes data on expenditures in fourteen categories: total current expenditures and transfers; instruction; research; public service; academic support; student services; institutional support; operation and maintenance of the physical plant; scholarships and fellowships; mandatory transfers; nonmandatory transfers; auxiliary enterprises; hospitals; and independent operations (U.S. Department of Education, 2003; Losco and Fife, 2000). The survey has cross-institutional comparative utility as it allows researchers to determine the level of spending (i.e., policy commitment) to each category. The 1999/2000 academic year finance survey is utilized in this evaluation. Bear in mind that incrementalism is typically the dominant budgetary mode for most institutions of higher education (Lindbloom, 1959; Losco and Fife, 2000).

While the primary focus of this paper is the analysis of commitment to research (relative to teaching and service) among doctoral universities, we also utilize data on master's colleges and universities I as a point of contrast. Two categories of master's colleges and universities (I and II) are included in the 2000 classification. The master's colleges and universities I institutions are utilized in this investigation in order to assess whether or not there are substantive differences in budgeting allocations between this group and the doctoral intensive group in particular. The institutions in this category offer a wide range of baccalaureate programs, and are committed to graduate education through the master's degree (no doctoral programs exist). During the period in scrutiny, these institutions awarded 40 or more master's degrees per year across 3 or more disciplines (Carnegie Foundation for the Advancement of Teaching, 2001, p.26). Our analysis is guided by the following questions: are there important differences between doctoral extensive and doctoral intensive institutions? Do spending patterns at doctoral intensive institutions differ significantly from master's colleges and universities I?

**Table 1: The Carnegie Classification of Institutions of Higher Education: 1973, 1994, 2000.**

<b>1973</b>	<b>1994</b>	<b>2000</b>
<i>I Doctoral-Granting Institutions</i>	<b>I. Doctoral-Granting Institutions</b>	<b>I. Doctoral/Research Universities</b>
Research Universities I Research Universities II Doctoral-Granting Universities I Doctoral-Granting Universities II	Research Universities I Research Universities II Doctoral Universities I Doctoral Universities II	Doctoral/Research Extensive Doctoral/Research Intensive
<b>II. Comprehensive Universities and Colleges</b>	<b>II. Master's (Comprehensive) Colleges and Universities</b>	<b>II. Master's Colleges and Universities</b>
Comprehensive Universities and Colleges I  Comprehensive Universities and Colleges II	Master's (Comprehensive) Colleges and Universities I Master's (Comprehensive) Colleges and Universities II	Master's Colleges and Universities I  Master's Colleges and Universities II
<b>III. Liberal Arts Colleges</b>	<b>III. Baccalaureate Colleges</b>	<b>III. Baccalaureate Colleges</b>
Liberal Arts Colleges I Liberal Arts Colleges II	Baccalaureate (Liberal Arts) Colleges I Baccalaureate (Liberal Arts) Colleges II	Baccalaureate Colleges—Liberal Arts Baccalaureate Colleges—General Baccalaureate/Associate's Colleges
<b>IV. Two-Year Colleges and Institutes</b>	<b>IV. Associate of Arts Colleges</b>	<b>IV. Associate's Colleges</b>
<b>V. Professional Schools/Other Specialized Institutions</b>	<b>V. Specialized Institutions</b>	<b>V. Specialized Institutions</b>
Theological Seminaries Medical Schools/Centers Other Separate Health Professional Schools Schools of Engineering and Technology Schools of Business and Management Schools of Art, Music, and Design Schools of Law Teachers Colleges Other Specialized Institutions	Theological Seminaries Medical Schools/Centers Other Separate Health Professional Schools Schools of Engineering and Technology Schools of Business and Management Schools of Art, Music, and Design Schools of Law Teachers Colleges Other Specialized Institutions	Theological Seminaries Medical Schools/Centers Other Separate Health Professional Schools Schools of Engineering and Technology Schools of Business and Management Schools of Art, Music, and Design Schools of Law Teachers Colleges Other Specialized Institutions
	<b>VI. Tribal Colleges and Universities</b>	<b>VI. Tribal Colleges and Universities</b>

Minor revisions from 1976 and 1987 are not included.

Source: Adapted from Carnegie Foundation for the Advancement of Teaching, 2001.

#### **IV. Simple Descriptive Statistics.**

Simple descriptive statistics are provided for public institutions and private institutions in Table 2. The mean represents the sum of the values in each category (instruction, research, and public service) divided by the number of values. The smaller the standard deviation, the more the data cluster about the mean (Losco and Fife, 2000, pp. 57-58). The standard deviation is the most common measure of dispersion for interval-level data, and reflects the dispersion of data points about the mean. Clearly, doctoral institutions (extensive and intensive) spent more on research; for public institutions, they also spend more on public service. Differences in budget allocations to teaching also exist, with doctoral institutions generally spending a smaller percentage of

**Table 2: Institutional Expenditures, By Carnegie Classification Scheme, 1999-2000 (Percent of Institutional Spending.**

		% Spent on Instruction		% Spent on Research		% Spent on Public Service	
<b>Public</b>	<b>Institutions</b>	<b>Mean</b>	<b>S.D.</b>	<b>Mean</b>	<b>S.D.</b>	<b>Mean</b>	<b>S.D.</b>
	Doctoral Extensive (N = 101)	27.7%	6.4%	15.9%	7.3%	6.2%	4.6%
	Doctoral Intensive (N = 62)	33.1%	7.0%	10.6%	9.0%	3.7%	3.0%
	Master's I (N = 246)	34.6%	5.5%	2.0%	2.8%	3.1%	3.4%
<b>Private</b>	<b>Institutions</b>	<b>Mean</b>	<b>S.D.</b>	<b>Mean</b>	<b>S.D.</b>	<b>Mean</b>	<b>S.D.</b>
	Doctoral Extensive (N = 49)	34.5%	10.5%	15.8%	10.3%	1.3%	2.1%
	Doctoral Intensive (N = 43)	39.5%	12.0%	6.7%	10.7%	2.6%	8.7%
	Master's I (N = 230)	38.2%	8.3%	1.0%	4.0%	1.2%	2.3%

their budgets on instruction, the differences are also generally small. While these figures are illuminating, a more rigorous analysis follows which affords heightened insight concerning institutional similarities and differences in each of the spending categories in question.

#### **V. Research Hypothesis/Appropriate Statistical Technique.**

It is hypothesized, in a general sense, that the Carnegie classification scheme affects institutional spending on instruction, research, and public service:

H<sub>1</sub>: Carnegie classification scheme (X) impacts institutional spending (Y)

The null hypothesis is that there is no relationship between the Carnegie classification scheme and institutional spending:

H<sub>0</sub>:β=0

Since the objective of this research effort is to identify a discernible impact, if any, of Carnegie institutional categories (explanatory variables) on institutional spending in the three traditional focal areas in the academy (ultimate dependent variables), multiple regression is the optimum manner in which to empirically test H<sub>1</sub> (see Tufte, 1974, pp.135-163; Fife and Miller, 2002).

#### **VI. Specification of the Model.**

A multiple regression equation generally takes the following form:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + e$$

Where, Y=ultimate dependent variable; α=intercept or constant; β=regression coefficients for the explanatory (x) variables; and e=error term. The dependent variables (Y) in this evaluation are the percentages of overall spending allocated to instruction, research, and public service. The explanatory variables (X) are the three Carnegie institutional categories of interest (doctoral extensive, doctoral intensive, and master's I). The most plausible manner in which to operationalize them is by creating three dichotomous variables, otherwise known as binary, categorical, or dummy variables.

##### *A. Using Dummy Variables.*

Dummy variables are only assessed values of zero or one. In order to prevent perfect

multicollinearity, one category is omitted. The  $\beta$  coefficients reflect the changes in the dependent variable with respect to the reference group (the group that is left out). The intercept reflects the value of the dependent variable for the reference group. The t ratio associated with the coefficient on a specific dummy variable is utilized to determine whether or not that group differs statistically from the reference group (Schroeder, Sjoquist, and Stephan, 1986, pp.56-58).

### *B. The t Ratio.*

The null hypothesis that  $\beta=0$  can be tested by computing the t ratio and comparing it to the appropriate t statistic. If the t ratio is greater than the appropriate t value, the null hypothesis can be rejected at a specified level of significance. In the social sciences, the most common level is the 95 percent confidence interval. If the value of the test statistic lies in the critical region, then it is statistically significant from the other categories (in this instance at the .05 level of significance) and means that the sample size may vary up to 5 percent or less from the population 95 times out of 100.

According to Bernstein and Dyer (1992), "The requirement that findings be significant at the .05, or a more restrictive, level reflects the fact that the scientific community fears the acceptance of an untrue hypothesis much more than the failure to accept a true hypothesis. It also reflects the scientific community's goal of establishing a body of knowledge by building on sets of confirmed hypotheses. If there is any reasonable doubt about the empirical support for a hypothesis, it is better to delay acceptance until it is retested than to accept and build on it. The requirement of such restrictive levels of significance may also stem from a concern that researchers may be advocates of the hypotheses they are testing, and advocates may be tempted to fudge findings ever so slightly to favor their hypotheses" (p.182). With this in mind, the .01 and .05 levels of significance are utilized in this evaluation.

### *C. Three Equations.*

Since a reference group has to be deleted when using dummy variable analysis, three equations are utilized in order to test  $H_1$  (for both the public and private institutions). Each equation is tested using each of the three dependent variables. The models include the following:

$$1) PB = \alpha + \beta_1 (\text{Doctoral Extensive}) + \beta_2 (\text{Doctoral Intensive}) + e$$

Where, PB=percent of total budget allocated for instruction, research, and public service;  $\alpha$ =value of the dependent variable for the reference group (Master's I); Doctoral Extensive=dummy variable (1=Doctoral Extensive institutions; 0=otherwise); Doctoral Intensive=dummy variable (1=Doctoral Intensive institutions; 0=otherwise); and e=error term.

$$2) PB = \alpha + \beta_1 (\text{Doctoral Extensive}) + \beta_2 (\text{Master's I}) + e$$

Where, PB=percent of total budget allocated for instruction, research, and public service;  $\alpha$ =value of the dependent variable of the reference group (Doctoral Intensive); Doctoral Extensive=dummy variable (1=Doctoral Extensive institutions; 0=otherwise); Master's I=dummy variable (1=Master's I institutions; 0=otherwise); and e=error term.

$$3) PB = \alpha + \beta_1 (\text{Doctoral Intensive}) + \beta_2 (\text{Master's I}) + e$$

Where, PB=percent of total budget allocated for instruction, research, and public service;  $\alpha$ =value of the dependent variable of the reference group (Doctoral Extensive); Doctoral Intensive=dummy variable (1=Doctoral Intensive institutions; 0=otherwise); Master's I=dummy

variable (1=Master's I institutions; 0=otherwise); and e=error term.

The statistical results are presented for the public institutions in Table 3. The first part of Table 3 presents regression results for Percent of Budget Allocated to Instruction both for public institutions (Panel A) and for private institutions (Panel B); for Percent of Budget Allocated to Research both for public institutions (Panel C) and for private

**Table 3. Regression Results.**

	<i>Model 1</i>	<b>Model 2</b>	<b>Model 3</b>
<b>Panel A. Percent of Budget Allocated to Instruction Public Institutions</b>			
Constant	34.6** (0.4)	33.1** (0.8)	27.6** (0.6)
Doctoral Extensive	-7.0** (0.7)	-5.4**	
Doctoral Intensive	-1.5 (0.8)		5.4** (1.0)
Masters		1.5 (0.8)	7.0** (0.7)
R <sup>2</sup>	0.19	0.19	0.19
<b>Panel B. Percent of Budget Allocated to Instruction Private Institutions</b>			
Constant	38.2** (0.6)	39.5** (0.6)	34.5** (1.3)
Doctoral Extensive	-3.7* (1.5)	5.0* (1.9)	
Doctoral Intensive	1.3 (1.5)		5.0* (1.9)
Masters		-1.3 (1.5)	3.7* (1.5)
R <sup>2</sup>	0.02	0.02	0.02

Standard errors of the coefficients in parentheses.

\*\* Statistically significant at the 1% level.

\* Statistically significant at the 1% level.

institutions (Panel D); for Percent of Budget Allocated to Public Service both for public institutions (Panel E) and for private institutions (Panel F); for Percent of Budget Allocated to Research.

#### *D. Interpreting the Results<sup>2</sup>.*

*Instruction.* The data in Table 2 suggest that Doctoral Extensive do not depend more on instruction than do other types of institutions, and may spend less. For public institutions, the constant term is always significantly different from zero at the 1% level. Whether the reference group is Master's institutions or Doctoral Intensive institutions, the results indicate that Doctoral Extensive institutions spend a significantly smaller percentage of budgets on instruction. However, the difference between Doctoral Intensive and Master's institutions is not statistically significant.

For private institutions, Doctoral Extensive institutions allocate a significantly smaller percentage of their budgets to instruction as well, whether compared to Doctoral Intensive institutions or to Master's institutions; however, the difference is significant only at the 5% level. Once again, Doctoral Intensive and Master's institutions appear to spend essentially the same percentages of their budgets on instruction. Both for public and for private institutions, the explanatory power of the regressions, as shown by the  $R^2$ s is small (19% of the variation in instructional spending is explained for public institutions, and only 2% for private institutions).

*Research.* The raw numbers in Table 2 indicate that doctoral institutions allocate a larger percentage of their budgets to research than do master's institutions (between 6.7% and 15.9%, compared with 1-2%). The regression analysis demonstrates that these differences are statistically significant. In all formulations of the model, the constant terms and the coefficients are statistically significant from zero. All the coefficients estimated for doctoral institutions are significant at the 1% level, and those for master's institutions are significant at the 1% level as well. In addition, the models have much larger  $R^2$ s (0.55 for public institutions and 0.40 for private institutions) than do the models for instructional spending and for public service spending. The importance of doctoral institutions in explaining variation in spending on research is noteworthy, but not unexpected.

*Public Service.* The pattern of spending shown in Table 2 is not as clear-cut as is the pattern in instructional spending or in research. Among public institutions, Doctoral Extensive institutions

**Table 3 (Continued). Regression Results.**

	<i>Model 1</i>	<b>Model 2</b>	<b>Model 3</b>
<b>Panel C. Percent of Budget Allocated to</b>			

<sup>2</sup> We have chosen to present regression results which show the effects of including or excluding each of the three institutional categories. Readers not familiar with regression analysis incorporating dummy variables will note the following two features of the results. First, the choice of which category of institution to exclude has no effect on the explanatory power ( $R^2$ ) of the regression. Second, the choice of which category to exclude has no effect on the structural properties of the regression. For example, consider these two formulations of the model:

$$\% \text{Research} = \alpha_1 + \beta_{1,1} * (\text{DoctoralExtensive}) + \beta_{1,2} * (\text{DoctoralExtensive})$$

(where Masters is the excluded category)

$$\% \text{Research} = \alpha_2 + \beta_{2,1} * (\text{DoctoralExtensive}) + \beta_{2,3} * (\text{Masters})$$

(where Masters is the excluded category)

The reader will note that  $\alpha_2 = \alpha_1 + \beta_{1,2}$  and  $\beta_{2,1} = \beta_{1,1} - \beta_{1,2}$  and  $\beta_{2,3} = 0 - \beta_{1,2}$ . That is, Model 2 is a linear transformation of Model 1. This will be true for all model pairs in which the only change is from one excluded institutional category to another.



<b>Research Public Institutions</b>			
Constant	2.0** (0.3)	10.6** (0.7)	15.9** (0.5)
Doctoral Extensive	14.0** (0.6)	5.4** (0.9)	
Doctoral Intensive	8.6** (0.8)		-2.5** (0.6)
Masters		-8.6** (0.8)	-3.1** (0.4)
R <sup>2</sup>	0.55	0.55	0.55
<b>Panel D. Percent of Budget Allocated to Research Private Institutions</b>			
Constant	1.0** (0.4)	6.7** (1.0)	15.8* (0.9)
Doctoral Extensive	14.7** (1.0)	9.1** (1.4)	
Doctoral Intensive	5.6** (1.1)		-9.1** (1.4)
Masters		-5.6** (1.1)	-14.7** (1.0)
R <sup>2</sup>	0.40	0.40	0.40

Standard errors of the coefficients in parentheses.

\*\* Statistically significant at the 1% level.

\* Statistically significant at the 1% level.

**Table 3 (Continued). Regression Results.**

	<i>Model 1</i>	<b>Model 2</b>	<b>Model 3</b>
<b>Panel E. Percent of Budget Allocated to Public Service Public Institutions</b>			
Constant	3.1** (0.2)	3.7** (0.7)	6.2** (0.4)
Doctoral Extensive	3.1** (0.4)	2.5** (0.9)	
Doctoral Intensive	0.6 (0.5)		-2.5** (0.6)
Masters		-0.6 (0.5)	-3.1** (0.4)
R <sup>2</sup>	0.11	0.11	0.11
<b>Panel F. Percent of Budget Allocated to Instruction Private Institutions</b>			
Constant	1.2** (0.3)	2.6** (0.6)	1.3* (0.5)
Doctoral Extensive	0.1 (0.6)	-1.2 (0.8)	
Doctoral Intensive	1.4* (0.6)		1.2 (0.8)
Masters		-1.4* (0.6)	-0.1 (0.6)
R <sup>2</sup>	0.01	0.01	0.01

Standard errors of the coefficients in parentheses.

\*\* Statistically significant at the 1% level.

\* Statistically significant at the 1% level.

spend more (twice as large a percentage as do Master's institutions), while among private institutions, Doctoral Intensive institutions spend twice as large a percentage of their budgets on public service as do Doctoral Extensive or Master's institutions. The regression results bear this out. The difference between spending in Doctoral Intensive institutions and Master's institutions is statistically significant in Models 1 and 2, and the difference between Doctoral Intensive institutions

and Doctoral Extensive institutions is nearly (but not quite) statistically significant in Models 2 and 3. However, as was the case with instructional spending, none of the models explains a significant percentage of the variation between institutions (the  $R^2$  is only 0.01).

## VII. Conclusion.

Our data reinforce the Carnegie Foundation assertion that the number and array of doctoral degree conferrals correlates well with institutional commitment to research. The analysis adds the perspective that this correlation holds whether research is measured by absolute dollars or by spending priority, i.e., as measured by proportion of overall spending committed to research. This investigation adds an additional nuance, however. Whereas officials representing doctoral institutions spend proportionately more on research than master's degree institutions in both the public and private categories, support for instruction and public service yields interesting similarities.

Among private institutions, there is little variance in commitment to instruction between doctoral extensive, doctoral intensive, and master's I institutions. Among public sector institutions, only doctoral extensive institutional representatives spend significantly less on instruction than their counterparts in the other two categories. Yet even at doctoral extensive public institutions, however, instructional spending is still the largest budgetary component among the three major functional groups examined. In light of the fact that more undergraduates receive baccalaureate degrees at research institutions than at either masters or baccalaureate colleges (Carnegie Foundation for the Advancement of Teaching, 2001, p.20) and considering the recent debate about the relative neglect of undergraduate education at research institutions (Boyer Commission on Educating Undergraduates in the Research University, 1998), it is important to note the magnitude of expenditures all of these institutions devote to instruction relative to other spending categories. Whatever problems may or may not exist with the deliverance of undergraduate education at research institutions, there is clearly no lack of financial effort by doctoral institutions toward meeting the needs of instruction.

This research effort also suggests that doctoral intensive universities may be the chief beneficiaries of any new Carnegie classification that includes institutional mission. This is because, with the exception of additional resources devoted to research and a small number of doctoral programs, there is little in the objective spending measures that differentiates these institutions from master's I colleges and universities. Spending on instruction and public service is nearly identical for doctoral intensive and master's I institutions in the public arena and there is little difference between the two in the private sphere as well. Doctoral intensive schools may be able to attain a greater degree of differentiation once self-reported institutional mission is sufficiently accounted for in the Carnegie classification scheme.

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